MONITORING PLAN

PROJECT NO. TE-17 FALGOUT CANAL PLANTINGS DEMO

ORIGINAL DATE: June 25, 1996
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original monitoring plan was reduced in scope due to budgetary constraints. Specifically, the project monitoring was reduced to a five year effort to be consistent with other demonstration projects. Based on monitoring results to date, the project was deemed ineffective and all monitoring will conclude in year 1998.

Project Description

Falgout Canal was constructed across wetlands and through existing waterways in Terrebonne Parish, Louisiana between 1906 and 1909 (figure 1). It was originally constructed to allow transportation of seafood and other products between the villages of Dulac and Theriot, Louisiana (Simon and Ensminger 1993). The canal was later extended west into Lake DeCade and into coastal marshes to the southwest. This provided access for oyster and shrimp boats to processing facilities located along Bayou du Large and Bayou Grand Caillou. In 1964, the U. S. Army Corps of Engineers constructed the Houma Navigation Canal (HNC). This created a deep channel from the Gulf of Mexico to inland canals including Falgout Canal. By the early 1980's, land loss and saltwater intrusion in the area between the west bank of the HNC and the east bank of Bayou du Large had progressed to the point that almost all of the fresh/intermediate marsh and much of the cypress/tupelo swamp had been killed or severely stressed.

In order to reduce saltwater intrusion and lower water levels in marshes adjacent to the HNC and Falgout Canal, the Falgout Canal Protection project (TE-02) was constructed in 1993. The TE-02 project area (figure 2) encompasses 7,423 ac (2,969 ha) composed of cypress/tupelo swamp, fresh/intermediate marsh, brackish marsh, and open water. The TE-02 project includes levee construction on the western and southern project boundaries, seven water control structures, five of which are along Falgout Canal, and a pumping station on Bayou du Large. The objectives of the TE-02 project are to protect approximately 8,000 ac (3,200 ha) of marsh and cypress/tupelo swamp, reduce saltwater intrusion, and improve wildlife habitat.

Boat traffic and greater tidal influence have contributed to increased shoreline erosion along Falgout Canal. The levee bordering Falgout Canal, constructed as part of the TE-02 project, has experienced severe erosion at a rate of approximately 3 ft/yr (0.9 m/yr) and requires protection (SCS 1991). The objectives of the Falgout Canal Plantings demonstration project (TE-17) are to reduce shoreline erosion along 1,450 ft (442 m) of the northern bank of Falgout Canal and to pusue new and innovative wave protection techniques. The project area totals 73 ac (29 ha) and will be located within a portion of the 5,000 ft (1,524 m) of shoreline bordered by the TE-02 project to the north, Falgout Canal to the south, structure 1 (station 13) of TE-02 along the northern bank of Falgout

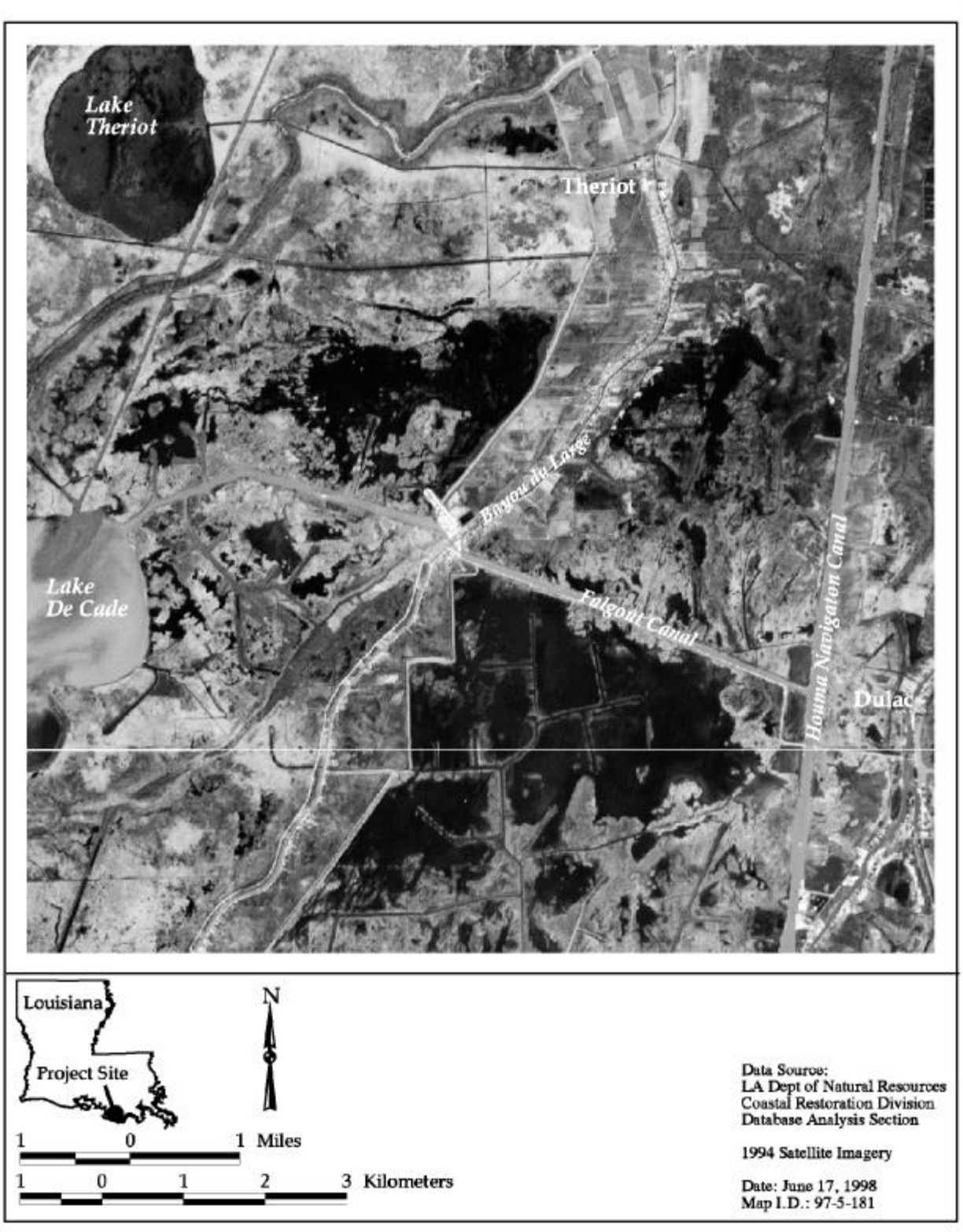

Figure 1 . Location of Falgout Canal in Terrebonne Parish, Louisiana.

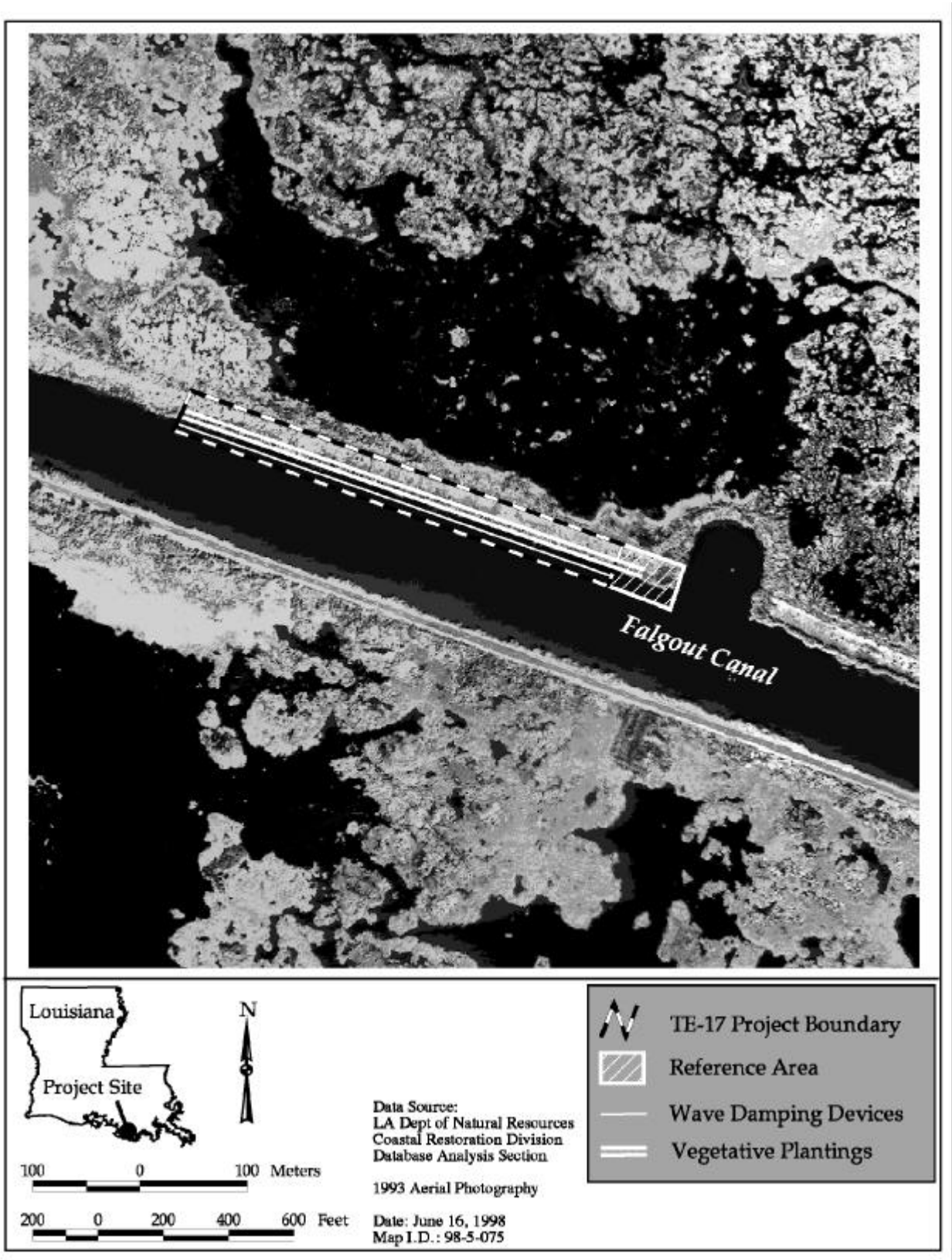

Figure 2. Falgout Canal Plantings Demonstration (TE-17) project boundary and features.

Canal to the west, and structure 2 (station 14) of TE-02 along the northern bank of Falgout Canal to the east. The project consists of 6 different types of wave damping devices along the northern bank of Falgout Canal (figure 3). Type A will be constructed of timber and oriented perpendicular to the shoreline (figure 4). Type B will be constructed of timber and oriented parallel to the shoreline (figure 4). Types C and D will consist of Uniaxial Geogrid supported by timber posts oriented perpendicular to the shoreline (figure 5). Type E will consist of Uniaxial Geogrid supported with timber posts oriented parallel to the shoreline (figure 6). Type F consists of erosion control mat laid on the shoreline (figure 6). *Spartina alterniflora* (smooth cordgrass) will be planted in a single row on 5-6 foot centers between the wave damping devices and the northern bank of the canal. A reflector assembly will also be constructed in Falgout Canal to mark the project area (figure 5).

Vegetation in the area is composed of *Typha sp.*(cattail), *Phragmites australis* (roseau), *Baccharis halimifolia* (baccharis), *S. alterniflora*, *Juncus roemerianus* (black rush), and *Zizaniopsis miliaceae* (giant cutgrass). Nutria (*Myocaster coypus*), swamp rabbit (*Sylvilagus aquaticus*), and northern raccoon (*Procyon lotor*) inhabit the area.

Project Objectives

1. Pursue new and innovative wave protection techniques to protect vegetational plantings.

2. Minimize erosion and provide restoration of a portion of the northern bank of Falgout Canal through the use of vegetational plantings.

Specific Goals

The following measurable goals were established to evaluate project effectiveness:

1. Protect a management area levee by reducing shoreline erosion along 1,450 ft (442 m) of the northern bank of Falgout Canal through the use of wave damping devices and *S. alterniflora* plantings.

2. Determine the effectiveness of wave damping devices of various designs in stabilizing vegetational plantings and reducing shoreline erosion.

Reference Area

To assist in evaluating the degree of success of the wave damping devices in stabilizing the shoreline, protecting the vegetation and reducing erosion, a reference area of shoreline and water bottom was chosen based on proximity to the project area, soil types, conditions at the reference area, vegetation, and water depth. The entire northern bank of Falgout Canal between Bayou du Large and the HNC was evaluated as a reference area. An area adjacent to the project area was chosen for the following reasons: (1) conditions at the reference area will be the same as within the

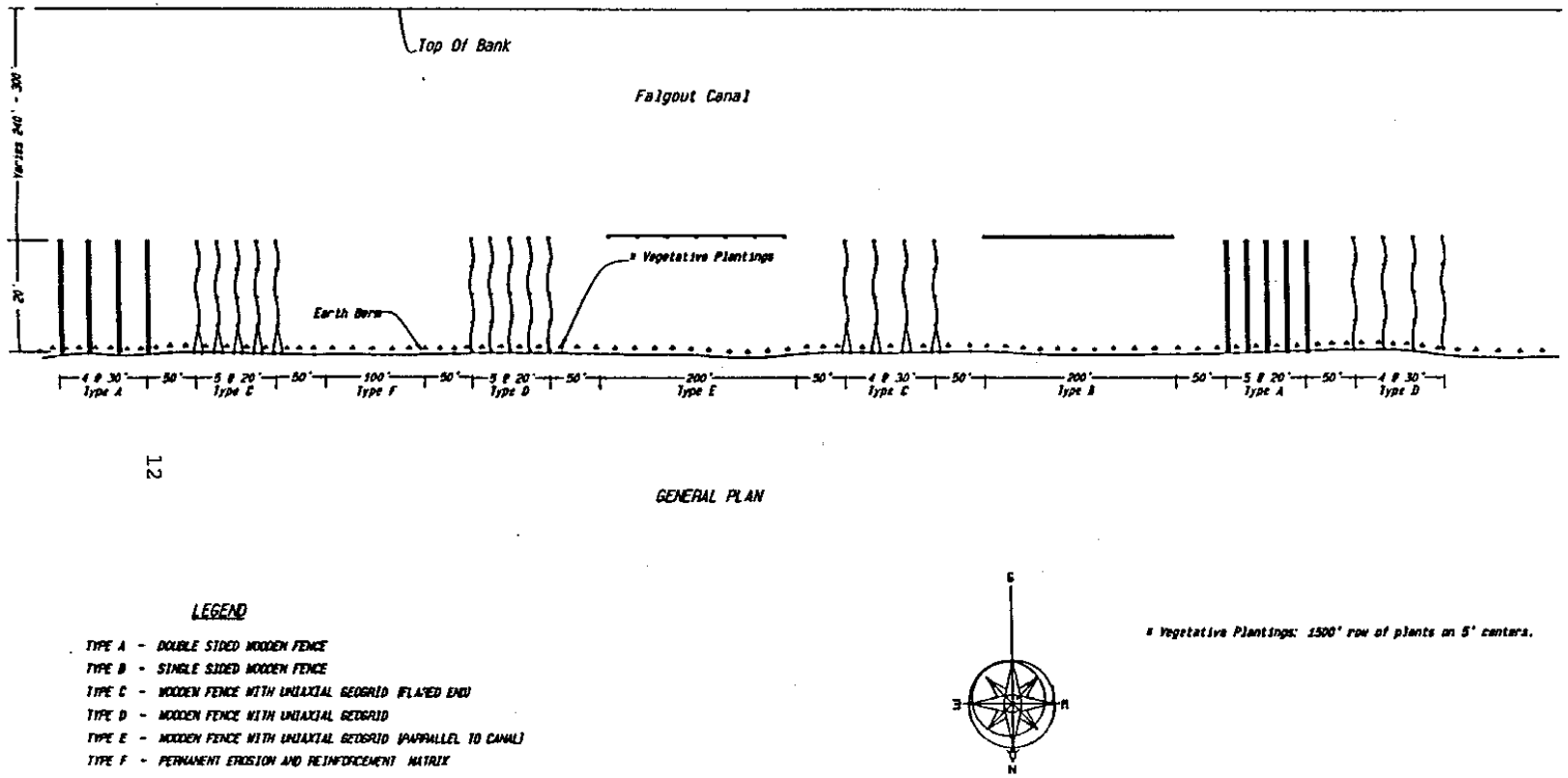

Figure 3. General plan of the Falgout Canal Plantings demonstration project.

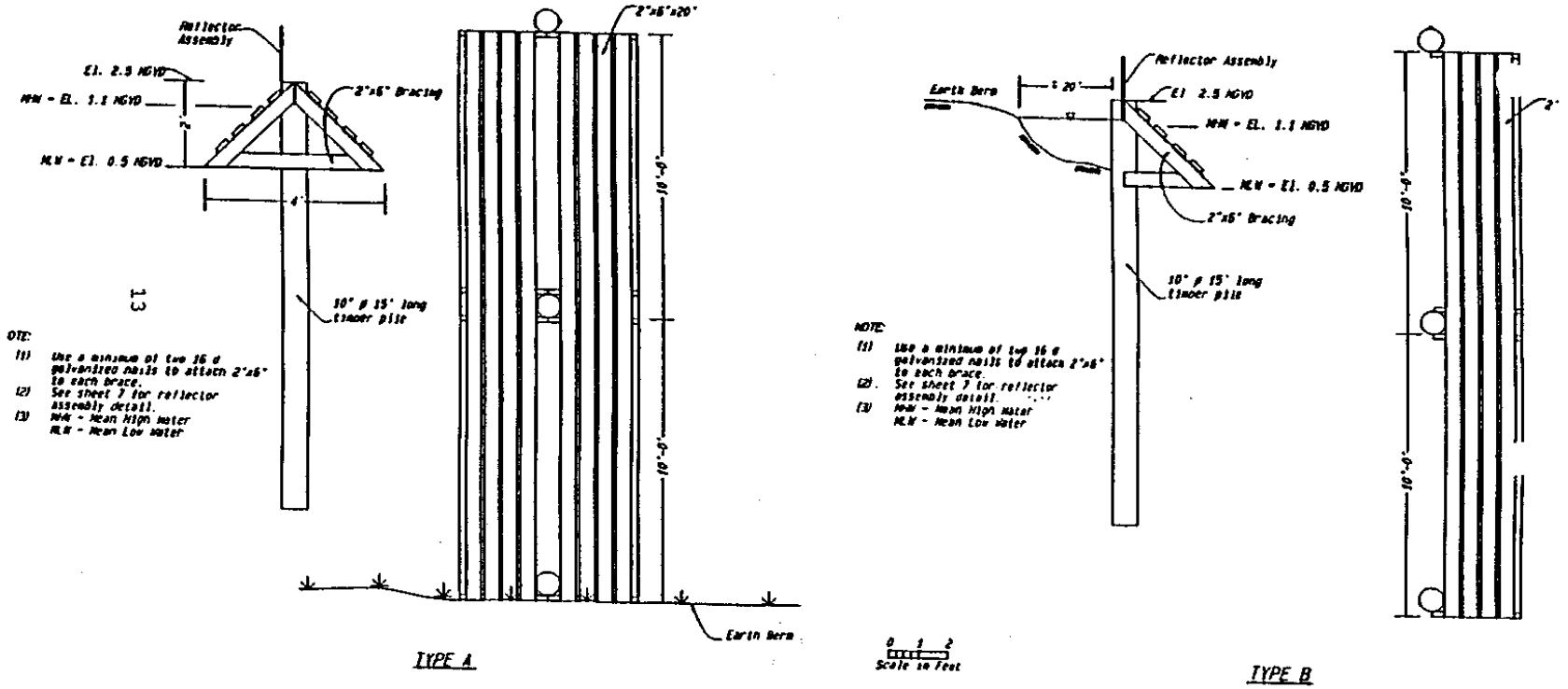

Figure 4. Design Type A and Type B wave damping devices.

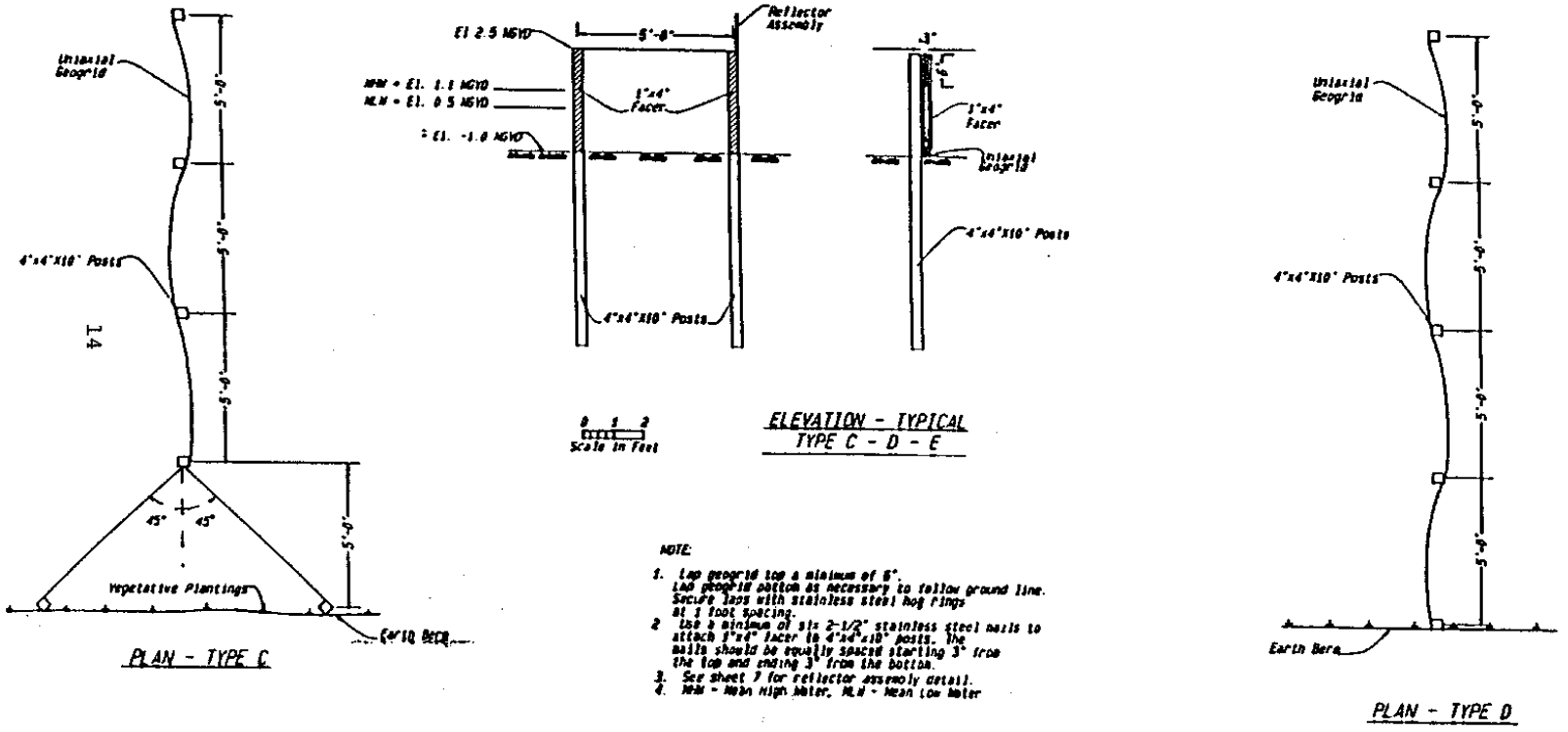

Figure 5. Design of Type C and Type D wave damping devices and reflector assembly.

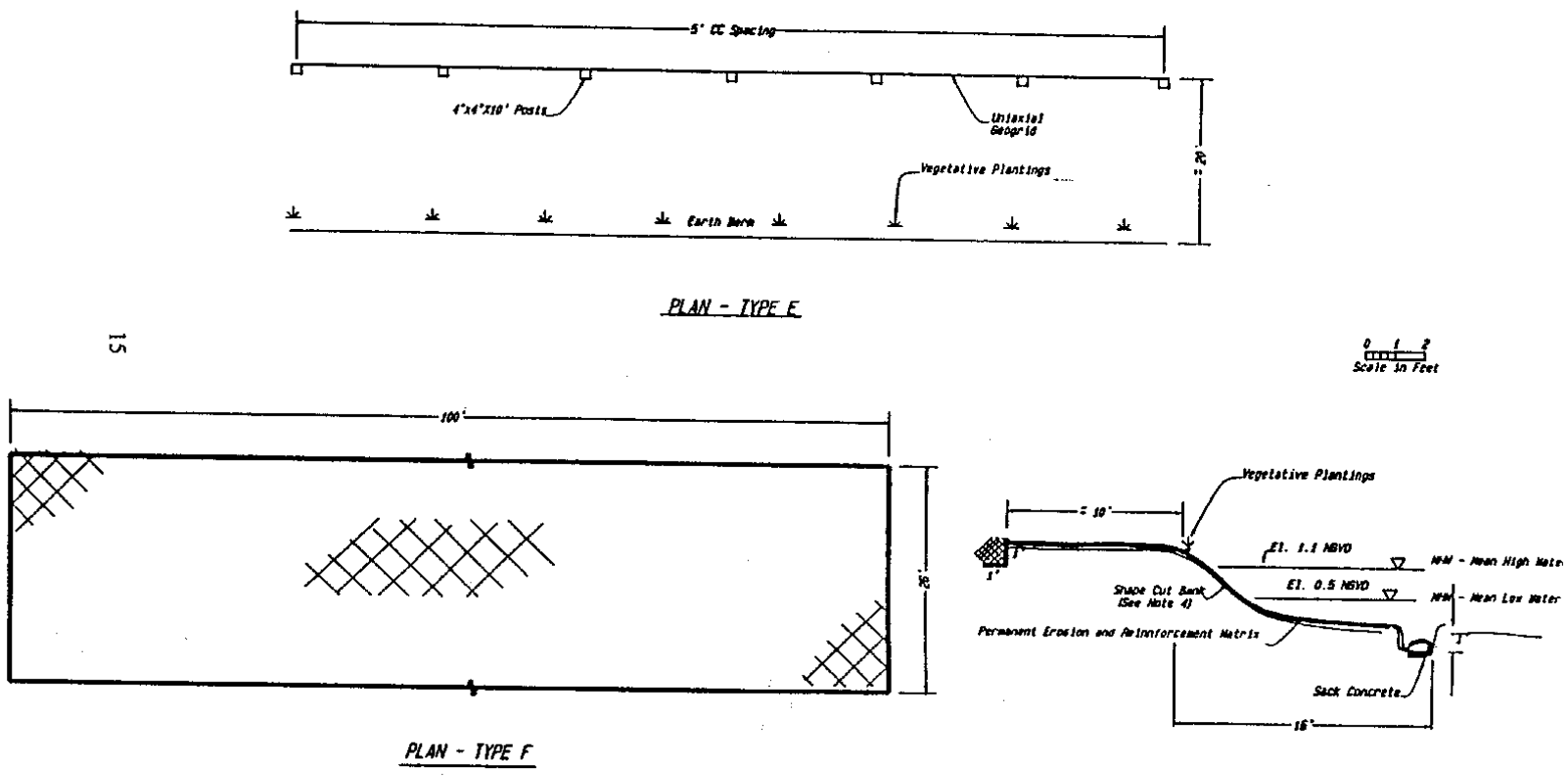

Figure 6. Design of Type E and Type F wave damping devices.

project area but will not be impacted by the project, (2) vegetation and soils within the reference and project are similar, (3) the reference area will be within the 5,000 ft (1,524 m) of shoreline between structure 1 and structure 2 of the TE-02 project, and (4) the reference area chosen allows identical monitoring for the reference and project areas and facilitates valid statistical comparisons. At least ten (10) plantings of *S. alterniflora* are in the designated reference area. References for shoreline erosion are to both the vegetated and unvegetated portions of the reference area, while vegetational cover references are to the vegetated portion only.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Aerial Photography — To measure vegetated and non-vegetated areas, near-vertical color infrared aerial photography (1:12,000 scale with ground control markers) will be flown prior to planting in 1993 and one time after planting in 1997.

2. Shoreline Change — To document shoreline movement, 3 shoreline markers per shoreline protection structure type will be placed at the mean high water line along the shoreline adjacent to vegetational plantings within the project area. An equal number will be placed within the reference area. The markers will be a maximum of 100 ft (30.5 m) apart. Position of the shoreline relative to the shoreline markers will be documented 5 times by direct measurement; once pre-construction in 1997 and in post-construction years 1998, 1999, 2000, and 2002. Additionally, continuous differential GPS will be used according to Steyer et al. (1995) to document shoreline movement adjacent to the wave protection devices and at the reference sites. Readings will be obtained pre-construction in 1997 and in post-construction year 1998. Because of the ineffectiveness of the shoreline structures, monitoring will end in 1998. Shoreline positions will be compared to historical data sets.

3. Vegetation — The general condition of the plants will be documented using a generally accepted methodology similar to Mendelssohn and Hester (1988), Coastal Vegetation Project, Timbalier Island: Percent survival, plant vigor, lateral spread, and percent cover will be measured. From the planted vegetation, a minimum of 10 plants at each shoreline protection structure type will be randomly selected and repeatedly monitored to document the establishment of the vegetational plantings. Vegetation will be sampled at 1 month and 6 months post-planting (1997), and in 1998. Because only a few of the vegetative plantings survived, monitoring will end in 1998.

Anticipated Statistical Analyses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

2. The primary method of analysis for shoreline erosion will be to determine differences in mean erosion rates as evaluated by an analysis of variance (ANOVA) that will consider both spatial and temporal variation and interaction. Multiple comparisons will be used to compare individual means across different treatment levels. All original data will be analyzed and transformed (if necessary) to meet the assumption of ANOVA (e.g. normality, equality of variances). When the H_0 is not rejected, the possibility of negative effects will be examined.

   Goal: Protect a management area levee by reducing shoreline erosion along 1,450 ft (442 m) of the northern bank of Falgout Canal through the use of wave damping devices and *S. alterniflora* plantings.

   Hypothesis A:

   H_0: Mean shoreline erosion rate at project structure type *k* or the reference shoreline at time *i* will not be significantly lower than the mean shoreline erosion rate at any other shoreline at time *i*.

   H_a: Mean shoreline erosion rate at project structure type *k* or the reference shoreline at time *i* will be significantly lower than the mean shoreline erosion rate at any other shoreline at time *i*.

   If we accept the above null hypothesis, this indicates that none of the structures are effective. If we reject the null hypothesis, then we will test Hypothesis B.

   Hypothesis B:

   H_0: Mean shoreline erosion rate at project structure type *k* shoreline at time *i* will not be significantly lower than the mean shoreline erosion rate at the reference *m* shoreline at time *i*.

   H_a: Mean shoreline erosion rate at project structure type *k* shoreline at time *i* will be significantly lower than the mean shoreline erosion rate at the reference *m* shoreline at time *i*.

   If we accept the above null hypothesis for all six structure types, then we will test Hypothesis C.

Hypothesis C:

H_0: Mean shoreline erosion rate at project structure type *k* shoreline at time *i* will not be significantly lower than the mean shoreline erosion rate at any other project shoreline at time *i*.

H_a: Mean shoreline erosion rate at project structure type *k* shoreline at time *i* will be significantly lower than the mean shoreline erosion rate for at least one other project shoreline at time *i*.

Pairwise comparisons will be performed among the six structure types to determine which structure is most effective at time *i* in reducing shoreline erosion rates. This will be accomplished through the testing of Hypothesis D.

Hypothesis D:

H_0: Mean shoreline erosion rate at project *k* structure type at time *i* will not be significantly lower than the mean shoreline erosion rate at project *j* structure type at time *i*.

H_a: Mean shoreline erosion rate at project *k* structure type at time *i* will be significantly lower than the mean shoreline erosion rate at project *j* structure type at time *i*.

3. The primary method of analysis for vegetational cover will be to determine differences in mean vegetational cover as evaluated by an analysis of variance (ANOVA) that will consider both spatial and temporal variation and interaction. Multiple comparisons will be used to compare individual means across different treatment levels. All original data will be analyzed and transformed (if necessary) to meet the assumption of ANOVA (e.g. normality, equality of variances). When the H_0 is not rejected, the possibility of negative effects will be examined.

Goal: Determine the effectiveness of wave damping devices of various designs in stabilizing vegetational plantings and reducing shoreline erosion.

Hypothesis A:

H_0: Mean vegetational cover at project *structure type k* or the reference shoreline at time *i* will not be significantly less than the mean vegetational cover at any other project shoreline at time *i*.

H_a: Mean vegetational cover at project structure type *k* or the reference shoreline at time *i* will be significantly less than the mean vegetational cover at any other project shoreline at time *i*.

If we accept the above null hypothesis, this indicates that none of the structures are effective. If we reject the null hypothesis, then we will test Hypothesis B.

Hypothesis B:

H_0: Mean vegetational cover at project structure type *k* shoreline at time *i* will not be significantly higher than the mean vegetational cover at the planted reference shoreline at time *i*.

H_a: Mean vegetational cover at project structure type *k* shoreline at time *i* will be significantly higher than the mean vegetational cover at the planted reference shoreline at time *i*.

If we accept the above null hypothesis for all six structure types, then we will test Hypothesis C.

Hypothesis C:

H_0: Mean vegetational cover at project structure type *k* shoreline at time *i* will not be significantly less than the mean vegetational cover at any other project shoreline at time *i*.

H_a: Mean vegetative cover at project structure type *k* shoreline at time *i* will be significantly less than the mean vegetational cover for at least one other project shoreline at time *i*.

Pairwise comparisons will be performed among the six structure types to determine which structure is most effective at time *i* in increasing vegetational cover. This will be accomplished through the testing of Hypothesis D.

Hypothesis D:

H_0: Mean vegetational cover at project *k* structure type at time *i* will not be significantly less than the mean vegetational cover at project *j* structure type at time *i.*

H_a: Mean vegetational cover at project *k* structure type at time *i* will be significantly less than the mean vegetational cover at project *j* structure type at time *i.*

Notes

1.	Implementation:	Start Construction:	December 23, 1996
		End Construction:	January 23, 1997
		Planting:	May 12, 1997
2.	NRCS Point of Contact:	Cindy Steyer	(504) 389-0334
3.	DNR Project Manager:	Kenneth Bahlinger	(504) 342-7362
	DNR Monitoring Manager:	Lori Ziehr	(504) 447-0994
	DNR DAS Assistant	Chris Cretini	(504) 342-0277

4. The five year monitoring plan development and implementation budget for this project is $62,994. A comprehensive report will be available in May 1999. This report will describe the status and effectiveness of the project.

5. Historical information from aerial photography collected from the TE-02 project, data from a 1991 vegetational planting project, and pre-construction design information will be utilized when possible.

6. References:

Mendelssohn, I. A., and M. W. Hester 1988. Coastal Vegetation Project: Timbalier Island. Final report submitted to Texaco USA. New Orleans, Louisiana: State of Louisiana Agreement No. RC-84--01. 244 pp.

Simon, C., and A. Ensminger 1993. Vegetative delineation report - Falgout Canal Marsh Management (TE-02). LDNR/CRD and Wetlands Wildlife Management Co. 23 pp.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller, and E. Swenson 1995. Quality management plan for Coastal Wetlands Planning, Protection, & Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division.

U. S. Department of Agriculture - Soil Conservation Service (SCS) 1991. Vegetative plantings - chenier plain, deltaic plan and barrier islands. 17 pp.